WSMS

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ERPGS And TEELS For Chemicals Of Concern: Rev. 17m (Updated January 10, 2001)

INTRODUCTION:

The TEEL tables include all chemicals for which official Emergency Response Planning Guideline (ERPG) values had been issued prior to January 1, 2000[1]. Temporary emergency exposure limits (TEELs) are provided for over thirteen-hundred-and-forty additional chemicals. The chemicals are listed in Table 1, which includes the Chemical Abstract Services Registry Number (CASRN) whenever available, and some useful physicochemical data. Table 2 lists the ERPGs and TEELs for these chemicals in the original concentration-limit units, sorted alphabetically. In general, values are given in parts per million (ppm) for gases and volatile liquids. Table 3 is sorted by CASRN, while Table 4 gives TEELs in mass per unit volume, the ppm to mg/m^3 conversion being carried out at 25^oC and 760 mmHg before rounding. TEEL values that have been changed since Rev 16 was issued in January 2000 are indicated on both Tables 2 and 4.

The SCAPA-approved methodology published in the American Industrial Hygiene Association Journal[2] was used to obtain hierarchy-derived TEELs. Published toxicity parameters from SAX[3] and RTECS[4] were used to derive TEEL-2s and TEEL-3s for chemicals lacking concentration-limit hierarchy-based values. The methodology used is documented in a Westinghouse Savannah River Company Technical Report (WSRC-TR-98-00080)[5]. A paper entitled "Derivation of Temporary Emergency Exposure Limits (TEELs)" was published in the Journal of Applied Toxicology[6]. Hierarchy-based values are presented as is, but toxicity-based values are rounded down to factors of 10 of 1, 1.25, 1.5, 2, 2.5, 3, 3.5, 4, 5, 6, or 7.5, unless the derived value is within 5% of the limit above it (e.g., 290 is rounded to 300.

These temporary emergency exposure limits must be regarded as dynamic; if new concentration limits are issued (e.g., ERPGs, PELs or TLVs), or if new or additional toxicity data are found, TEELs will be revised. Further revisions will be issued as warranted. ERPGs adopted through 1/01/00 are on SCAPA's home page http://www.scapa.bnl.gov/ . WSRC-TR-98-00080 is also available at this address. The most recent TEEL list revision may be found on DOE EH's Chemical Safety home page http://tis-hq.eh.doe.gov/web/ chem_safety/teel.html.

Suggestions for improvement of this document, for chemicals to be added to the list, to the format, or anything else of relevance, are welcome. There is a charge that depends on the number of chemicals for deriving TEELs for chemicals not already on the list. All chemicals for which TEELs are derived will be added to the list. Suggestions or requests for copies of this document should contact Douglas K. Craig for details, at (803) 502-9640 (T), (803) 502-9779 (FAX), or doug.craig@wxsms.com (e-mail).

NOTES FOR TABLES:

Chemicals whose names are bolded are ones for which there were official ERPGs prior to January 1, 2000. "Added" means that the chemical has been added since Rev.16. If a TEEL

value has been changed in Rev. 17m from previously recommended values (see page 1), the affected values are indicated in the last column of Tables 2 and 4. These changes are usually the consequence of the correction or addition of data, or of rigid adherence to the above-automated methodology[5], any deviation from which is indicated.

A detailed version over 600 pages in length of this document can be made available for a fee. This includes all the input data (i.e., the first worksheet in the Excel workbook) used to generate hierarchy-based TEELs, and the selected toxicity data (based on the priority described in reference 5) data used to derive toxicity-based TEELs), and the physicochemical data included in Table 1. It also includes a table of hierarchy-based TEELs, and a table of procedure-based TEEL-2 and TEEL-3 values, in addition to the recommended TEELs.

- The physicochemical data given in these tables is extracted from various sources, not all of which are in agreement with each other. The differences are not usually large enough to be of concern in the conduct of safety analyses. All molecular weights (MW) are given to two decimal places.

- The primary sources of these data are references 3, 4, 7, and 8.

- Abbreviations used in Table 1 include:

amor = amorphous
at = atmospheres
dec = decomposes
deliq = deliquescent
expls = explodes
fibrs = fibers
hygr = hygroscopic
insol = insoluble
press = under pressure
sol = soluble
ubl = sublimes
pwdr = powder
vac = vacuum
visc = viscous

Hierarchy-based TEEL values are obtained by strict application of the methodology described in references 2, 5 and 6, except for the following.

Information pertinent to the derivation of hierarchy-based TEEL values:

- Permissible exposure limits (PEL)[9] used in earlier revisions of this document were vacated by Court order. Although these vacated values, adopted in 1989 (29 CFR 1910.1000-1910.1200, as of July 1, 1992) are more credible than the 1968 ACGIH TLV values to which the vacated PEL values reverted, they are no longer published in the Federal Register. Most OSHA (PEL), ACGIH (TLV)[10], and NIOSH (REL)[7] values used are taken from the "Guide to Occupational Exposure Values - 2000"[11], compiled by the American Conference of Governmental Industrial Hygienists. This publication also no longer lists vacated PEL values;

- For particulate materials, limits (mg/m^3) are for total dust, even though limits are sometimes also given for the respirable fraction;

- PNOC = Particulates Not Otherwise Classified. This TLV-TWA value is for total dust, and the respirable fraction is assumed to be 30% of total concentration;

- The note “1910.pqrs” refers to specific paragraphs in the Federal Register (29 CFR) regulating a particular chemical;

- For substances that are in particulate form and for which no ERPG-3 or hierarchy-based TEEL-3 is available, a maximum value of 500 mg/m^3 is used. This is based on the fact that this concentration constitutes an upper bound for a stable cloud of respirable dust. The coagulation rate is a function of the square of the number concentration, so it increases rapidly as the particle size decreases;

- WEEL[1]: AIHA Workplace Environmental Exposure Level Guides TWA, STEL or C;

- MAK[11]: Concentration limits adopted by the Federal Republic of Germany;

- Values are restricted by the hierarchy-based TEEL for the next higher category, e.g., TEEL-1 value is restricted by the TEEL-2 value to ensure that T-0 $\leq$ T-1 $\leq$ T-2 $\leq$ T-3;

- In a few instances, where the updated (1994) IDLH value for a chemical was less than a well-documented TEEL-2 value, the IDLH was not used as the TEEL-3. The IDLH documentation is not as rigorous as that for the 60-minute EEGL or TLV-C values;

- For a few chemicals whose "official" ERPG-1 value was odor- rather than toxicity-based, the TEEL-1 value was adjusted to the PEL-STEL, TLV-STEL, or 3 x TLV-TWA value;

- Some hierarchy-based TEEL-0 and TEEL-1 values are restricted by a PEL-C or TLV-C value, i.e., T-0 $\leq$ T-1 $\leq$ PEL-C or TLV-C;

- In the absence of other concentration limits, a few values are based on British, Finnish, Russian or other guidelines[12];
- The usual order of use of toxicity data for TEEL-2s and/or TEEL-3s is ignored if there are human toxicity data for a particular chemical;

- In the absence of both hierarchy- and toxicity-based TEELs, the following default ratios have been used:

  TEEL-0 = (TEEL-1)/3 if there is a TEEL-1;
  TEEL-1 = (TEEL-0) x 3 if there is a hierarchy-based TEEL-0, and no PEL-STEL, TLV-STEL, PEL-C or TLV-C;
  TEEL-1 = (TEEL-2)/7 if there is a toxicity-based TEEL-2. This is based on the mean ratio of existing ERPG-2s to ERPG-1s;
  TEEL-2 = (TEEL-0) x 5 if there is a hierarchy-based TEEL-0, and no PEL-STEL, TLV-STEL, PEL-C or TLV-C;
  TEEL-2 = (TEEL-3)/ 5 if there is either a hierarchy-based or a toxicity-based TEEL-3. This is based on the mean ratio of existing ERPG-3s to ERPG-2s;
  TEEL-3 = (TEEL-2) x 5 if there is either a hierarchy-based TEEL-2 or a toxicity-based TEEL-2;

- A few values depart from the usual guidelines, and are estimates based on existing concentration limits (at other TEEL values) and/or a comparison with similar chemicals

and/or a review of available toxicity data. For example, the TEEL-3 value for 1-Bromo-3-chloro-5,5-dimethylhydantoin is estimated from the toxicity-based TEEL-3 for 3-Bromo-1-chloro-5,5-dimethylhydantoin;

- In a few instances, the toxicity-based TEELs were significantly less than the Hierarchy-based values. When this occurs, a notation is entered, e.g., “Ignore HT-2”;

- All TEELs other than hierarchy-based values are rounded;

- All other notations should be self-explanatory.

DEFINITION OF TEELs:

TEELs are intended for use until Emergency Response Planning Guidelines (ERPGs) are adopted for chemicals. Therefore, with the exception of the recommended averaging time, TEELs 1, 2, and 3 have the same definitions as the equivalent ERPG. These are:

ERPG-1 The maximum concentration in air below which it is believed nearly all individuals could be exposed for up to one hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.

ERPG-2 The maximum concentration in air below which it is believed nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.

ERPG-3 The maximum concentration in air below which it is believed nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effects.

Temporary Emergency Exposure Limits (TEELs):

TEEL-0 The threshold concentration below which most people will experience no appreciable risk of health effects.

TEEL-1 Same as ERPG-1

TEEL-2 Same as ERPG-2

TEEL-3 Same as ERPG-3

It is recommended that for application of TEELs, concentration at the receptor point of interest be calculated as the peak fifteen-minute time-weighted average concentration. It should be emphasized that TEELs are default values, following the published methodology explicitly. The only judgement involved is that exercised in the extraction of data used to calculate the recommended TEELs.

REFERENCES:

1 The AIHA 2000 Emergency Response Planning Guidelines and Workplace Environmental Exposure Level Guides Handbook. AIHA Press, Fairfax, Virginia (2000).

2 Craig, D.K., J.S. Davis, R. DeVore, D.J. Hansen, A.J. Petrocchi, and T.J. Powell. Alternative Guideline Limits for Chemicals without ERPGs. *Amer. Ind. Hyg. Assoc. J*. **56**, 919-925 (1995).

3 Lewis, R.J.,Sr.: Sax's Dangerous Properties of Industrial Materials, 10th Ed. Van Nostrand Reinhold, New York, (1999). This publication is now available as a CD ROM (now from Wiley Environmental Science), which is updated periodically. The 1998 Releases 4 version was used for most of the data in Rev. 17.

4 CHEM-BANK ™ (February 2000) Databanks of potentially hazardous chemicals: RTECS® – U.S. Department of Health and Human Services (NIOSH) Compact disc Vol. ID:CB15. SP-018-052 (SilverPlatter). This CD also includes other data bases, which have been scanned for pertinenent data if necessary. These include: OHMTDS – US Environmental Protection Agency; CHRIS – U.S. Department of Transportation (Coast Guard); HSDB – U.S. Library of Medicine; IRIS - US Environmental Protection Agency; TSCA - US Environmental Protection Agency.

5 Craig, D.K. and C. Ray Lux: WSRC-TR-98-00080. Methodology for Deriving Temporary Emergency Exposure Limits (TEELs) (U). Westinghouse Savannah River Company, Aiken, SC (1998).

6 Craig, D.K., J.S. Davis, D.J. Hansen, A.J. Petrocchi, T.J. Powell, and T.E. Tuccinardi, Jr. Derivation of Temporary Emergency Exposure Limits. *J. Appl. Toxicol.* **20**, 11-20 (2000).

7 NIOSH Pocket Guide to Chemical Hazards: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control (June 1990). A revised "Guide" was issued in June 1997.

8 Lewis, R.J., Sr.: Hawley's Condensed Chemical Dictionary, 12th Ed. Van Nostrand Reinhold, New York, (1993). This publication is now available as a CD ROM (see Reference 3 above), which is updated periodically. The 1998 Release 4 version was used for Rev. 17.

9 Code of Federal Regulations, Title 29 – Labor, Part 1910.1000, Occupational Safety and Health Administration, Air Contaminants, Subpart Z: Toxic and Hazardous Substances. Tables Z-1, Z-2 and Z-3 (July 1997).

10 2000 TLVs® and BEIs® Threshold Limit Values for Chemical Substances and Physical Agents: The American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, OH (2000)

11 Guide to Occupational Exposure Values – 2000. Compiled by the American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1999).

12 Occupational Exposure Limits for Airborne Toxic Substances. Third Edition: Values of Selected Countries prepared from the ILO-CIS Data Base of Exposure Limits, International Labor Office, Geneva (1991).